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Title of the Invention:

SEMICONDUCTOR DEVICE AND PROCESS FOR MANUFACTURING SAME

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[Claims]

1. A semiconductor device comprising:

a ferroelectric thin film;

a gate electrode formed in contact with a first surface of the ferroelectric thin film; and

two source/drain electrodes formed in contact with a second surface of the ferroelectric thin film with the source/drain electrodes being spaced from each other,

wherein the second surface of the ferroelectric thin film is made semiconductive.

2. A semiconductor device comprising:

a ferroelectric thin film;

a gate electrode formed in contact with a first surface of the ferroelectric thin film; and

two source/drain electrodes formed in contact with a second surface of the ferroelectric thin film with the source/drain electrodes being spaced from each other,

wherein source/drain regions that are in contact with the source/drain electrodes on the second surface of the ferroelectric thin film are made semiconductive and imparted with a p-type or n-type conductivity, and the second surface of the ferroelectric thin film located between the source/drain regions is a channel region that is made semiconductive and imparted with the conductivity which opposes that of the source/drain regions.

3. A process for manufacturing a semiconductor device, comprising the steps of:

forming a gate electrode on a substrate or on a film formed on the substrate;

forming a ferroelectric thin film on the gate electrode;

making a surface of the ferroelectric thin film semiconductive such that a semiconductive region is provided at a part of the ferroelectric thin film; and

forming two source/drain electrodes with a distance to each other on the semiconductive region.

4. A process for manufacturing a semiconductor device, comprising the steps of:

forming a gate electrode on a substrate or on a film formed on the substrate;

forming a ferroelectric thin film on the gate electrode;

providing source/drain regions by making two spaced regions on the surface of the ferroelectric thin film semiconductive to impart these two regions with a p-type or n-type conductivity;

providing a channel region by making a region disposed between the source/drain regions on the ferroelectric thin film semiconductive to impart the channel region with the conductivity which opposes that of the two spaced regions; and

forming source/drain electrodes, one on each of the

source/drain regions .

[0026]

A semiconductor device of the invention can be used as a memory device by the use of a memory effect of ferroelectrics. Besides, the semiconductor device of the invention can also be used as a driving element for liquid crystal display devices. When a conventional thin film transistor is used, in order to maintain a display by pixels, it is required to always apply a gate voltage to a transistor that has been turned on. In contrast, for the thin film transistor according to the invention, the memory effect is used, as a result of which a gate voltage needs to be applied to a gate only when turning on the transistor.